THE ALIMENTARY CANAL AND HUMAN DECAY IN RELATION TO THE NEURONS.

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Death is a complex problem. In the varied stages of growth in the human system, we trace frequent indications of decay. At an early age, the hair bulb dies, the hair drops out, and disappears. In the same way, teeth decay, and the masticatory process is being rapidly accomplished, more by artificial than natural grinders. Such evidences of lessened vitality, are not confined to these tissues alone. Nerves and nerve centres participate readily. No part of the human system is attracting closer or more careful observation than nerve tissue and the part it plays in the promotion of the vital spark, so essential to every act of life. The brain is the great battery, plastic, pliant, thought producing, and having as its matrix, cells, which communicate with the cells (nervous) in all parts of the human frame. This linking of cell agency is all important, any interruption to such connection being at once marked by functional inactivity. Recent discoveries, in the line of nerve tissue formation, have defined small cellular, almost rod shaped bodies, as component parts of cell nervous tissue, *known as neurons*, which doubtless play an exceedingly important part, as to the elimination of normal nerve power, without which, no positively healthy function can be established. For some time, my attention has been directed towards a study of the alimentary canal, so peculiarly constituted. Into this canal, from the mouth to the anus, are poured the secretions of the various glands, outside and inside of which, is more than a life's study. Sanitary science is making rapid progress, but outside sewage cannot compare, as to importance, with the internal sewage of the human system. It is a well known fact what the toxic effect of an impure gas is upon the system under the most ordinary circumstances. So in the intestinal canal supplied by a nervous system of a most elaborate and complex structure, it is most reasonable to suppose that the activity of these very neurons, in the ganglionic centres around this very canal, should in time become subject to marked functional inactivity, and long prior to any evidence whatever of organic disease. The gases of the human system are not so noxious as carbonic acid, and still, the want

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[1] Read [illegible] the Medical Society, Ottawa, October 27th, 1898.

of care in the digestive process, cannot, and in fact does not, fail to bring about results of a most telling character in the very process of sanguification. The death process in life, is often slow, and yet, progressive in character. Intestinal villi, and the mucous membrane of this complicated alimentary canal, depend largely on the distribution of normal nerve force, in order to keep up normal activity. In this very canal, the death process frequently sets in, long prior to a recognition of the fact. One of the most interesting topics, recently brought to notice by at least four or five writers, two in Germany, one in France and one in America, is the idea, that the nerve cells, were capable of movement, to such an extent as to enable them, to alter the degree of their relationship to one another. The only physiological observation quoted in behalf of this theory, is that in 1890, by Wiedershein, a German, who saw in "Leptodora Hyalina," an invertebrate, one of the Entomostraca, the nerve cells of the œsophageal ganglion move in a slow flowing fashion. Altered relationship of the neurons may be connected with a retarded distribution of nerve power, and thus become closely associated with the development of the hysterical paralytic condition, so transitory in character. The explanation given, is that the neurons of the arm centre of the cortex, retract their processes in such a way, that their end tufts, no longer bear the normal relation to the spinal neurons. We must acknowledge that a new sphere of observation, is opened up, by this attractive departure in neurological structure, having so wide a range, and yet so closely associated, with the normal distribution of nerve power. The process of renewal of old combinations of neurons, has been ingeniously, worked out, and may lead to the discovery of new truths, of much practical value, as tc the regulating power of nervous energy. "Experiments " appear to afford adequate evidence that, in a normal state of the body, " the integrity of the medullary vaso-motor centre, is essential to the " production and distribution of those continued constrictor impulses, " by which the general arterial tone of the body is maintained, and that " an increase or decrease of vaso-constrictor action in particular arteries, " or in arteries generally, is brought about by means of the *same* " *medullary vasomoter centre.* But we must not conclude therefore, " that this small portion of the medulla-oblongata is the only part of " the central nervous system which can act, as a centre for vasomotor " fibres. We are rather to suppose, that the spinal cord, along its whole " length, contains, interlaced with the reflex and other mechanisms by " which the skeleton muscles are governed, vaso-motor centres and " mechanisms of varied complexity, the details of whose functions and " topography, *have yet largely to be worked out.*" ***(Foster's Physiology,*** **1893. p. 281 and 284.)**

That there is much new ground to be broken, in the line of observation, connected with the spinal vaso-motor centres, is conceded by leading physiologists. " It has been demonstrated that the body is " constantly subjected to the risks of poisons produced within itself, " many of the poisons produced, such as the ptomaines and leucomaines, " are of the chemical nature of the previously known alkaloids, in " toxic power, and reproduce their leading effects. The organism, " even in a state of (supposed) health, is a veritable storehouse of these " toxic substances. The respiratory passages, and intestinal canal, are " crowded with micro-organisms. In these circumstances it is of " interest to enquire, what defence, man can oppose to the disease " and death producing poisons, by which he is so constantly endan-" gered." (Address in Medicine by Thomas Richard Fraser, M.D., British Medical Association.) Long prior to disease, the result of toxic origin, we have the indications of toxic functional disturbance, and nowhere more so, than in the intestinal canal. According to Foster's (p. 285) Physiology, the chief and usual cause of the movements of the stomach and intestines, is the presence of food in the interior. " The afferent impulses from the stomach travel apparently by the vagus, *but we do not know the exact manner in which the food produces the movement*, and again (on page 384) the alimentary canal, like the heart, though to a less degree, possesses within itself such mechanisms, as are requisite for carrying out its own movements, and as in the case of the heart, *there is no adequate evidence that the ganglia scattered in its muscular walls*, viz., *those forming the plexus of Auerbach, play any part in developing these movements.*" Thus far it is quite evident, a considerable degree of doubt exists, as to the exact physiological ground work, on which rests the remarkable changes which take place in food transformation, prior to becoming incorporated with human tissue. The conversion of vegetable matter into muscle or blood, is unique in character, and entirely in advance of the finest external laboratory manipulation. The plexus of Meissner in the submucous coat of the bowels ; the plexus of Auerbach, in the thin sheet of connective tissue of the muscular layers of the intestine ; and lastly, the vaso-motor centres of the spinal cord, constitute a trio of nerve generating power alike interesting and attractive, and which doubtless are intimately associated, in the transforming process of food to tissue, and yet we must acknowledge, with Prof. Charcot, that there still exist numerous lacunæ in this study. The nervous system, reduced to very simplest form, is represented by two elements, a nerve cell, and a conducting tube, and the association of these two elements constitutes nerve centres, and nerves, which guide and direct capillary circulation in every part of the human frame. The point to which I desire to call attention at present, is with reference to the influence gradually produced in the system, by defective intestinal sewage, and how it is to be remedied. That such at times produces a poisonous influence on nerve tissue and capillary circulation, is undoubted in character, and of much greater importance and frequency, than generally supposed. While noting the effect of electricity, through the neurotone, on the muscular tissue of the dilated or ballooned bowel, I was impressed by the marked improvement otherwise, in the system, in consequence of which, a series of observations was made, on the alimentary canal, which led to the following deductions :

1st. The irregularities of the digestive process in the alimentary canal, are of much more frequent occurrence than generally supposed.

2nd. The internal sewage of the system, cannot be too critically examined.

3rd. The toxic effect of such accumulations leads to a condition of the nerve centres, changed in character, and destructive in a great measure to the elimination of normal nerve energy, in the ganglionic nerve centres. That the recently discovered neurons, play an important part in the vitalizing power of nerve energy, is a reasonable deduction. A path is now open, in which life, under ordinary circumstances, *may be prolonged,* providing no organic disease is present. There is little doubt, that as years pass on, in a quasi indifferent manner, the *neurons,* of the ganglionic centres, particularly in close relationship with the alimentary canal, become influenced, by the toxic effect, of defective internal sewage, and as the result, blood making power becomes defective, as photographed in facial expression. The question is, how to counteract this condition, and bring about, as near as possible, a normal state of the system. One of the first points to observe, beyond the ordinary conditions of the alimentary canal, is the state of the abdominal nervous system. Under ordinary circumstances the application of the Electro-Neurotone of Hodgkinson, to the abdominal walls, produces a sensation electric in character, which must be adjusted, to the needs of the patient. The power of static electricity seems to be chiefly as a regulator of functions, according to *Munnell, of Brooklyn.* It increases metabolism, so a person can absorb more oxygen, and this improvement in nutrition, is a vast power for good. The spark of its action, sets up a molecular change, and acts as a stimulating massage. At the convention of the American Electro-therapeutic Association, Dec. 29, 1894, (*The Times and Register*) it was reported, that static electricity causes contraction of the protoplasm, both animal and vegetable, it excites nerve fibres, nerve centres, and

nerve cells, to functional action, and to produce their separate effects, motor, sensory, secretory, sympathetic and vaso-motor. These data, electric in character, induced me to make further enquiry, by which it was ascertained that many cases of constitutional debility had their origin in the alimentary canal, aud that the nervous system participated largely in such abnormal conditions.

In the discussion of Dr. Buzzard's paper (Edinburgh Meeting British Medical Association) on the Selective Action of Toxic Bodies on the Nervous System, the following statement was made: "It seems "likely from the clinical symptoms, that whilst at the outset there is "profound interference with the nutrition of 'the neurons' over a "widely extended area, recovery rapidly occurs, in such as do not "suffer change in their nucleus." It is this class of cases particularly, to which I refer, of a purely functional character, and not associated with *insular sclerosis*, or even *multiple neuritis*, both of which conditions are most likely the result of degenerative ehanges in nerve structure. Constitutional debility, the result of defective intestinal assimilation, protracted in character, is undoubtedly a powerful factor, in the poisoned nervous system, to keep up that condition. The neurons of the nerve centres, although not changed in structure, are in a measure defective as to function. Here, as well as in other neurotic states of the system, the precise condition is not, as yet, defined. However, when by the neurotone treatment, so marked improvement as to function takes place, the inference is, that the electric current, in a measure re-vivified the nerve centres, and their neurons, in direct connection, so as to re-establish the normal distribution of nerve power, in those parts defective in that particular. The following recent observations of E. Muller and Manicatide (March 3rd, 1898, *Deutsche Medicinische Wochenschrift*). "Examined the cells in the central nervous system, of seven infants, under three months of age, who had suffered from gastro-intestinal diseases. In all seven, changes were found in the cells, of the brain and spinal cord. The cells were found to lose their form, become indistinct and even the processes of the cells disappear, and the nucleus, as well as the nucleolus, often displaced."

These observations point beyond a doubt, to a close relationship between alimentary assimilation and nerve cell agency. Everything has a beginning, and the problem is, how to obviate the difficulties, which may take place even in ordinary intestinal functional disturbance, at a time when treatment may be of service *and life's span thus prolonged.* The physiological action of electric currents plays an important role, in the treatment of diseases of the nervous system. True, the nerve current has been compared to electricity, but this idea, has recently been abandoned. The important point is, that by the action of the electric current, we modify the electric state of the nerve, and the properties of the sensory or motor nerves reappear, and perform their regular part in the economy. There, by the influence of currents, nutrition is sure to improve the vitality of the tissues stimulated to renewed energy, brought about by a direct action on the trophic nerves, and on the tissue molecules of the organism, whose vitality is thus summoned into increased activity.

Alexander James, M.D. (Edinburgh, British Medical Association), in his paper on the Clinical Varieties of Hepatic Cirrhosis, stated " that the effect of an irritant on living tissue is increased metabolic activity, and the effect of increased metabolic activity is the sacrifice of growth and development to reproduction."

The systemic condition on which I now base these observations, is in cases of diminished metabolic activity in the *neurons*, prior to a sacrifice of growth and development, as after that stage, little if any influence in an electric method can be exercised. Fully aware of the doubt and uncertainty of biological problems, and while seeking for the explanation of certain functional disturbances, these few facts have been noted.

The alimentary canal and its distubances, have within the past few years, attracted more than ordinary attention. The impression is gaining ground, that various manifestations of disease may arise through the absorption of toxic substances from within the canal. The arguments in favour of the toxæmic origin of intestinal disturbance are not sufficiently clear, owing to the absence of clinical data based on the pathological conditions involved. The important fact announced in 1880 by Baumann, that the various aromatic substances formed within the intestine, such as indol, phenol, cresol, etc., produced by " *anærobic bacteria*" upon proteids, are passed off by the body, when absorbed through the urine, in combination with sulphuric acid in the form of etherial sulphates (Herter, *N. Y. Medical Journal*, July, 1895). This fact forms the basis of the study of *intestinal putrifaction*, on which line of chemical research, this subject requires much careful enquiry. The frequency of perityphlitis is an acknowledged fact, and the discovery by Salkowski, of pathological quantities of *indican* in connection with that disease, leads to a line of investigation of much interest. The symptoms which usually direct attention to the alimentary canal, are often so slight as to readily escape notice, while at the same time, the constitutional results may be well defined. The following cases are presented as an illustration of clinical manifestations occurring in individuals with whom intestinal indigestion and neurotic disturbance were prominent factors.

The sensation of pain in cases of intestinal indigestion is not a usual symptom, and it is in quasi indifferent cases, where putrefactive changes are slowly progressing without even spasm of the muscular coats of the intestines, that careful information should be obtained, not only as to the rapidity of the digestive process, but also as to the peculiarity of the alvine evacuations. In no part of the entire system, does functional disturbance proceed more steadily and quietly than in the alimentary canal, and it is remarkable how its mucous lining accommodates itself to the high living of the present age.

Diminution as to firmness of muscular fibre ; occasionally indications of lassitude ; a feeling of emptiness, described as a " gone feeling," indisposition for either mental or physical exertion, without any assignable cause, are marked pointers for *neurotone* treatment to correct functional, neurotic, and digestive irregularities, in the alimentary canal, prior to the advent of structural change. The treatment in such cases, beyond ordinary tonics and purgatives, as required, consists in neurotone applications, to the abdomen and spinal column alternately, at intervals of two or three days, and not over ten minutes at any one time, the parts being first moistened by a sponge, Such may be continued, until the nerve centres, recover their tone, which usually occupies from three to four weeks, in ordinary cases. When objections are experienced, the applications may commence on the arms and legs.

Case I. E. G., æt. 58 years of age, of temperate habits, has had indifferent health, for some months, at times depressed and despondent, indications of debility, insomia and irregular appetite. Occasional headache, coated tongue, flatulence, and at times a sense of cardiac uneasiness, urine voided in normal quantity, with excess of lithic acid ; these symptoms alternated considerably, just as abdominal functional disturbance fluctuated. Baths, tonics and diet, prescribed and yet the almost hypochondriac condition continued, until placed under *neurotone* treatment. After three weeks, he was greatly improved in health, and quite equal to his usual official duties.

Case II. Mrs. McQ., æt. 63 years, mother of four children, weight 103 lbs., temperate in every way. Experienced a feeling of general debility, languid, wanting in tone, and in fact, indisposed to undertake any bodily exertion whatever, appetite small, and digestive power feeble. Cardiac action regular, but weak. Muscular system flabby and deficient as to normal tonacity, slight constipation, intestinal flatulence, but no abdominal pain. Sleep only moderately composed. Urine voided in normal quantity, with no presence of sugar or albumen. The indisposition extended over a period of fully two years. June 5, 1898, placed under *neurotone* treatment ; as she improved the sensitiveness of the skin became more acute, and in about two months she looked like a different person, active, willing to walk, and without fatigue; appetite much improved; the entire tone of the nervous system was such as not experienced for years previous, and returned to her home in British Columbia, with every hope of many years of increased usefulness.

CASE III. Mr. B., æt. 28 years, weight 128 lbs., temperate. Has found of late that he tires readily, and awakes in the morning not sufficiently refreshed. No organic disease. For fully three years, experienced indications of debility, without any special cause except irregularity as to intestinal absorption, abdomen at times considerably distended with gas. Marked palor of face and lips, and an exsanguine condition of the body generally. A peculiar leaden feeling about the abdomen, with a ballooned duodenum. Bowels not regular. No nausea or vomiting. Appetite as a whole good, but the strength and support gained, not in proportion to food taken, evidencing the escape of nutrient material. Urine voided in normal quantity, but overcharged with lithates. About twelve months ago became indisposed, owing to the peculiar feeling in his bowels, which continued until May, 1898, when I placed him under neurotone treatment twice a week for two months, after which the improvement as to his general condition was most marked. Prior to that date, tonics had little effect. At present he can wheel 15 to 20 miles a day, without inconvenience, which he could not undertake for months previous. The tone of the entire nervous system is most marked, and life now most enjoyable.

CASE IV. Mrs. F., æt. 78 years, mother of a large family, weight 108 lbs. Temperate. No evidence of organic disease. Muscles thin and flabby. Functions of the system, regular as a whole. For several years experienced flatulence and constipation, regulated by occasional castor oil. About two years ago, the digestive system, particularly the alimentary canal, was the seat of very considerable irregularity. A degree of general debility followed, attended by marked weakness, almost approaching heart failure, and inability to move about, with accustomed activity. In May, 1898, placed her under *neurotone* treatment, continued twice each week, for a period of two months. At the expiration of that time, markedly improved, as to alimentary digestive power, and the general vigor of her system. Oct. 12, 1898. Moves about her home with the activity of twenty years ago, and now expresses herself as feeling almost youthful once more. This is an illustration of neurons, almost on the shelf, called into action again and becoming useful factors in the promotion of renewed life and activity.